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Jean Morelle et al.

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Examiner: A. Pryor

Title: COMPOSITIONS FOR IMPROVING CROP PRODUCTION,
THE QUALITY AND PROTECTION THEREOF

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Commissioner for Patents
Washington, D.C. 20231

DECLARATION

Christophe de Mil declares as follows:

1. I am a named inventor in the instant application.
2. I have worked in the agricultural field for many years and especially in relation to use of amino acids, such as acylated amino acids and their salts, to affect crops. Much of my work has been focussed on both potatoes and grapes. I consider myself an agricultural expert with special knowledge of grape and potato physiology.
3. I am making this declaration in order to demonstrate the unique properties of copper salts of butyric amino acid on potatoes; the unique properties of copper salts of caprylic amino acid on grapes; and the unique properties of copper salts of

caprylic amino acid on beets. The tests reported herein were performed by me or under my direct supervision and control.

POTATO

4. Three different treatments using a copper salt of butyric collagen (C4coCu, sold under the name ECOBIOS) were applied to the potato plants. The treatments differed by the times at which the plants were treated, namely: treatment (a) was administered during the tuberisation phase; treatment (b) was administered at the end of the tuberisation phase (when the potato was 15 to 35 mm in diameter); and treatment (c) was administered when the potato was greater than 35 mm in diameter. For each treatment the dosage was a 30% aqueous solution which was administered at 100 grams per hectare. In each treatment there was a control which was treated with an equal amount of water. The treatment was a foliar spray.

5. The details for each treatment (a)-(c) were as follows:

Treatment (a) - Treatment of the potatoes was administered during the tuberisation phase in two tests as follows:

- In France at Bretagne in 1999, a field previously planted with "Delice" potatoes was divided in 2 blocs (each parcel containing 50 plants)
- In France at Somme in 1997, a field previously planted with

"Monalisa" potatoes was divided into 4 blocs (surface of each parcel was 3m x 0.9m)

The results from these two tests are reported in Table A attached hereto.

Treatment (b) - Treatment was administered under good weather conditions ($T^{\circ} > 18^{\circ}\text{C}$), when the potatoes were between 15 and 35 mm, in two tests as follows:

- In France at Somme in 1999, a field previously planted with "Saturna" potatoes was divided in 3 blocs (surface of each parcel was 3m x 0.75m)
- In France at Champagne in 1995, '96, '97 and '98, fields planted with "Monalisa" potatoes from 1995 to 1997 and "Russet Burbank" in 1998 were divided in 4 blocs (surface of each parcel was 5m x 0.75m and had the same number of plants).

The results from these two tests are reported in Table B attached hereto.

Treatment (c) - Treatment was administered to the potatoes after the plants had reached a stage of growth of 35 mm in two test as follows:

- In France at Aisne in 2000, a field previously planted with "Monalisa" potatoes was divided in 5 blocs (surface of each

parcel was 18 m²)

- In France in the Ardennes in 2000, a field previously planted with "Saturna" potatoes was divided into 5 blocs (surface of each parcel was 18 m²)

The results from these two tests are reported in Table C attached hereto.

6. Another test was conducted to compare the copper salt of butyric collagen (C4coCu, sold under the name ECOBIOS) to the copper salt of caprylic collagen (C8coCu). Identical treatments (doses 100 ml/ha) were administered under good weather conditions ($T^{\circ} > 18^{\circ}\text{C}$) when the potatoes were at the end of the tuberisation phase (between 15 and 35 mm) as follows:

- In France at Champagne in 1997, a field previously planted with "Monalisa" potatoes was divided in 4 blocs (surface of each parcel was 5m x 0.75m and had the same number of plants)

The results of this test are reported in Table D attached hereto.

7. The results of the experiment of Paragraph 6 were analyzed by a statistical method (Stat ITCF) established according to the works of J.W. Tukey and of H. Scheffe. The analyzation of variance compared the data by groups of 2 parcels and determined coefficient F of Snedecor in each case. Depending

on the degree of freedom in the experiment, the data are significant at 95% or 99%; if this is the case, "significant" is noted in Table D.

8. From the test results reported in Tables A-C, it can also be seen that the increased yield for potatoes was only achieved when the potatoes were treated at the end of the tuberisation phase. I find this surprising and unexpected because the prior art DeMil reference (U.S. Patent 4,797,151) makes no mention of treating potatoes at the end of the tuberisation phase to increase yield.

9. From the test results reported in Table E, it can be seen that the copper salt of caprylic collagen is less effective than the copper salt of the butyric collagen. I find this to be surprising and unexpected. Furthermore, the prior art DeMil reference makes no mention of this difference.

GRAPES

10. An aqueous solution of copper salt of caprylic collagen (C8coCu) was applied to Pinot Noir grapes at three different stages of growth, namely: at flowering, just after flowering (nouaison) and well after flowering (veraison). Four different plots B1-B4 were tested. Each plot was treated with a 40% aqueous solution at a dosage of 350 grams/hectare (350 ml/ha).

The control received an equal amount of water without the copper salt. Both the weight and the sugar content of the grapes were tested, and the results are reported in Table E attached hereto.

11. As can be seen from the results shown in Table E, treatment conducted just after flowering produced the highest yield of sugar while decreasing the weight of the grape. I find this surprising and unexpected, and DeMil makes no mention of increasing the sugar content of grapes using a copper salt of caprylic collagen.

12. Tests were run to compare the copper salt of butyric collagen (C_4CoCu) to the copper salt of caprylic collagen (C_8CoCu) using the same dosage and treatment method set forth in Paragraph 10 above for both Cabernet Sauvignon grapes and Pinot Noir grapes. Treatment in each case was conducted after flowering. The results of these tests are reported in Table F attached hereto.

13. As shown by the results reported in Table F, the copper salt of caprylic collagen was more effective than the copper salt of butyric collagen in increasing sugar content while the reverse occurred in terms of berry weight. I find such results to be surprising and unexpected.

BEETS

14. Using a 40% aqueous solution of a copper salt of caprylic collagen, sugar beet plants were sprayed to provide a 150 gram/hectare dose. Three separate treatments were conducted to determine the optimum time for treatment, namely: (1) at the early stages of leafing; (2) during azote accumulation after July 10; and (3) 30 days after the July 10 treatment. In each treatment there was a control group that was given an equal amount of water with the copper salt. The results of these tests are reported in Table G attached hereto.

15. As shown in the test results of Table G, it was found that the first treatment increased yield with no effect on sugar content. The second treatment resulted in increased sugar content while the third treatment had no effect on either yield or sugar content. It can also be seen that the first treatment resulted in increased yield of beets.

16. The tests of Paragraph 14 were repeated to compare a copper salt of butyric collagen (C4coCu) to a copper salt of caprylic collagen (C8coCu). It was found that the copper salt of butyric collagen increased yield but decreased sugar content of the beets compared to the control while the copper salt of the caprylic collagen increased sugar content of the beets and

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produced a yield comparable to the control. The results of these tests are reported in Table H attached hereto.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date

12 July 2002
CHRISTOPHE DE MIL

Experimental data
Potato

a/ Treatment administered during tuberisation phase

variety Delice 70.000 plants/ha
location Bretagne year 1999
50 plants/bloc

Bloc	caliber>55 mm		45/55 mm		35/45 mm		28/35 mm		<28 mm		total		Marketable > 45 mm	
	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number
control group														
B1	2800	18	13245	131	12340	208	2323	85	767	82	31475	524	16045	149
B2	5800	32	13100	120	8900	151	1900	69	505	45	30205	417	18900	152
Average	4300	25	13173	126	10620	180	2112	77	636	64	30840	471	17473	151
Ecobios														
B1	1896	11	11400	115	13800	245	2944	114	861	78	30901	563	13296	126
B2	2367	13	10000	101	11600	208	2205	79	468	52	26640	453	12367	114
Average	2132	12	10700	108	12700	227	2575	97	665	65	28771	508	12832	120

The Marketable Yield is significantly lower with Ecobios applied during the tuberisation phase and the number of tubercules is higher

variety Monalisa 40.000 plants/ha
location Somme year 1997
bloc: 3 m*0,9 m

Bloc	Ecobios		Control	
	Weight >40	Number	Weight >40	Number
B1	7,9	532	11,9	294
B2	8,9	587	13,4	273
B3	9,2	539	12,5	280
B4	9,3	521	13,2	253
Average	8,825	544,75	12,75	275

TABLE A

Experimental data
 Potato
 b/ Treatment administered when the potatoes are between 15 and 35 mm in diameter

Somme	Satuma	bloc1			bloc2			bloc3			moyenne			ECART
		T/ha	Control	ECOBIO5		Control	ECOBIO5		Control	ECOBIO5		Control	ECOBIO5	
	3*3*0,75	<40	9,78	9,33	<40	8,00	6,67	<40	9,78	6,67	<40	9,19	7,56	
	irrigué	40/50	20,89	18,67	40/50	18,22	16,89	40/50	16,89	21,33	40/50	18,67	18,96	
		>50	20,44	31,11	>50	26,22	31,56	>50	25,33	33,33	>50	24,00	32,00	
Homogenous parcels		Brut	51,11	59,11	Brut	52,44	55,11	Brut	52,00	61,33	Brut	51,85	58,52	Significant
		Total>40 en T/ha	41,33	49,78	Total>40 en T/ha	44,44	48,44	Total>40 en T/ha	42,22	54,67	Total>40 en T/ha	42,67	50,00	

+ article : 4 years of significant trials in Champagne by the "Chambre d'Agriculture de Champagne" showing +10 to 20 % of increased caliber yield

TABLE B

Experimental data
Potato

c/ Treatment administered after the stage of growth >35 mm

location O8300 year 2000
variety Monalisa
Stage 40 mm
T°celsius 21°C
bloc : 18 m²
days after application: T + 89 days
5 repetitions

	Weight < 50 mm	Weight 50-60 mm	Weight > 60 mm	Total Weight
Control	9,74	27,5	60,52	97,76
Ecobios	10,37	28,96	60,04	99,37

Non Significant

location O2270 year 2000
variety Saturna
Stage 40 mm
T°celsius 19°C
bloc : 18 m²
days after application: T + 89 days
5 repetitions

	Weight < 30 mm	Weight < 45 mm	Weight > 45 mm	Total Weight
B1	0,92	17,86	65,80	84,58
B2	0,56	16,60	71,18	88,34
B3	0,18	16,06	63,34	79,58
B4	0,22	16,58	67,32	84,12
B5	0,26	18,54	69,96	88,76
Average	0,43	17,13	67,52	85,08
B1	0,78	18,04	63,94	82,76
B2	0,66	18,44	69,66	88,76
B3	0,34	16,72	66,18	83,24
B4	0,42	14,64	72,04	87,10
B5	0,16	18,60	68,94	87,70
Average	0,47	17,29	68,15	85,91

Non significant

TABLE C

Experimental data
Potato

Differences in types of lipoproteins: Ecobios C4coCu versus C8coCu

location
variety
Stage
T°celsius
bloc : 10 m.
4 repetitions

Champagne
Monalisa
25 mm
20°C
year 1997

yield in T/ha

	bloc1	bloc2	bloc3	bloc4	Average	Stat ITCF
Control	504	527	540	515	521,5	B
C8coCu	504	588	583	546	555,25	B A
Ecobios C4coCu	560	603	556	581	575	A

yield>40 mm in Kg/ha

	bloc1	bloc2	bloc3	bloc4	Average	Stat ITCF
Control	4 843,44	5 064,50	5 189,40	4 949,20	5 011,64	B
C8coCu	4 835,88	5 641,90	5 593,90	5 238,90	5 327,65	B A
Ecobios C4coCu	5 396,16	5 810,50	5 357,60	5 598,50	5 540,69	A

The increased yield with Ecobios is significant and almost 50% better than the results obtained with the C8coCu

location : Beaune
year : 1987
variety : Pinot Noir

Sugar content (refractometer)				
	Control group	350 ml /ha during flowering phase	350 ml/ha after flowering (nouaison)	350 ml/ha after the previous phase (veraison)
B1	10,30	10,20	10,80	10,30
B2	10,20	10,30	10,50	10,00
B3	10,10	10,30	10,70	9,80
B4	9,90	10,60	10,60	10,30
Average	10,13	10,35	10,65	10,10
Stat	A	A B	B	A

weight of 100 grape berries (in grams)				
	Control group	350 ml /ha during flowering phase	350 ml/ha after flowering (nouaison)	350 ml/ha after the previous phase (veraison)
B1	191	153	180	193
B2	178	170	195	180
B3	180	167	203	173
B4	186	140	207	184
Average	183,75	157,5	196,25	182,5
Stat	A	B	A C	A

TABLE E

location : Beaune
year : 1986
Bloc of 15 plants
Test performed on 200 berries
variety : Cabernet Sauvignon

Sugar content (refractometer)			
	Control group	C4coCU	C8coCU
B1	9,70	9,40	9,90
B2	9,90	9,30	10,30
B3	9,60	9,50	10,20
Average	9,73	9,40	10,13
Stat	A	B	C

weight of 100 grape berries (in grams)			
	Control group	C4coCU	C8coCU
B1	125,00	153,00	130,00
B2	115,00	149,00	127,00
B3	136,00	147,00	135,00
Average	125,33	149,67	130,67
Stat	A	B	A

variety : Pinot Noir

Sugar content (refractometer)			
	Control group	C4coCU	C8coCU
B1	10,20	9,80	10,45
B2	10,10	9,70	10,60
B3	9,80	9,50	10,50
Average	10,03	9,67	10,52
Stat	A	B	C

weight of 100 grape berries (in grams)			
	Control group	C4coCU	C8coCU
B1	170,00	196,00	182,00
B2	185,00	215,00	190,00
B3	179,00	192,00	180,00
Average	178,00	201,00	184,00
Stat	A	B	A

significant
C4coCU decrease sugar content and increase yield
C8coCU increase quality with higher sugar content

TABLE F

Sugar Beets
 location : Meharicourt (80)
 year : 1989
 4 Blocs
 15 plants for each modality
 variety : Ariska

Sugar content				
	Control group	150 ml /ha during early stage of leafing	150 ml/ha during azote accumulation at july 10	150 ml/ha after the previous phase july 10 + 30 days
B1	15,8	15,9	17,2	16,2
B2	17,1	16,5	18,0	16,8
B3	16,8	16,7	17,9	17,0
B4	17,5	17,0	18,8	17,7
Average	16,8	16,5	18,0	16,9
Stat			significant	

Yield in Kg				
	Control group	150 ml /ha during early stage of leafing	150 ml/ha during azote accumulation at july 10	150 ml/ha after the previous phase july 10 + 30 days
B1	17,6	18,7	17,4	17,2
B2	16,8	17,3	17,2	17,0
B3	17,3	18,3	17,8	17,5
B4	16,4	17,5	17,0	16,7
Average	17,0	18,0	17,4	17,1
Stat		significant		

TABLE G

Sugar Beets
location : Vigny (95)
year : 1990
4 Bloc
12 plants for each modality
variety : Accord

Sugar content			
	Control group	C4coCU	C8coCU
B1	17,3	16,2	18,2
B2	18,2	17,4	19,2
B3	17,5	16,7	18,4
B4	17,4	16,2	18,7
Average	17,6	16,6	18,6
Stat	A	B	C

significant

Yield in Kg			
	Control group	C4coCU	C8coCU
B1	33,7	38,6	37,8
B2	28,7	35,1	29,9
B3	32,3	38,3	36,7
B4	30,7	34,2	29,7
Average	31,4	36,6	33,5
Stat	A	B	A

significant

TABLE H